



MAX48

INTEGRATED CYLINDER POSITION MEASUREMENT FOR MOBILE MACHINES

Linear encoders

SICK
Sensor Intelligence.



INTEGRATED CYLINDER POSITION MEASUREMENT FOR MOBILE MACHINES



Product description

The MAX48 linear encoder enables non-contact, completely integrated and absolute position measurement in hydraulic cylinders. Suitable for use under extreme ambient and operating conditions in applications in mobile machines. The innovative technology of magnetostriction offers high reliability,

expanded diagnostic functions and well as a considerable reduction in operating costs. The 48 mm housing can be easily installed in the existing cylinder construction. All in all, linear encoders from SICK impress with their attractive cost-benefit ratio.

At a glance

- Measuring range: 50 to 2,500 mm (1 mm steps), typical resolution 0.1 mm
- Analog, CANopen, SAE J1939 and PWM interfaces are available
- Pressure-resistant housing, designed for hydraulic operating pressure of up to 400 bar
- High operating temperature (electronics) up to +105 °C
- Fluid temperature (hydraulic oil) up to max. +95 °C
- Compact dimensions: 10 mm installation space, 30 mm damping zone
- Position magnet does not need a spacer disk

Your benefits

- Magnetostriction: Reliable, safe and wear-free
- 100% mechanical and electrically compatible with existing cylinder constructions
- Save-spacing installation: Better utilization of the piston stroke in tight installation space of the cylinder
- Extremely stable signal behavior and very good EMC properties: Resistant to extreme electrical influences, such as radiated or coupled faults in the on-board power supply
- Status monitoring: Monitoring of piston strokes, operating hours and max. oil temperature provides a statement about the cost-optimized operation of the machine
- Favorable cost-benefit ratio



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For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



Fields of application

Mobile work equipment

- Steering cylinder and spring systems
- Lifting and press cylinders on garbage trucks
- Stroke, swivel and tilt cylinders on telescopic handlers
- Support cylinders on work platforms
- Cutting system adjustment, steering assistance
- Loading crane monitoring, boom cylinders
- Gripper monitoring field on container cranes

Detailed technical data

Performance

	Analog	Digital	PWM
Measured values	Positioning	Positioning, speed	Positioning
Measuring range	Position 50 mm ... 2,500 mm Speed 0 ... 1,000 mm/sec		
Unusable range	Zeroset 30 mm End point (attenuation) 30 mm, 36 mm, 63 mm		
Switch-on time	< 250 ms		
Measuring frequency (internal)	2 ms	CANopen: 1 ms SAE J 1939: 20 ms	2 ms
Setting point (zero and end point of the piston stroke)	≤ 1 m		
Resolution	typ. ≤ 1,0 mm (noiseless)		
Hysteresis	± 0,1 mm		
Linearity	typ. ± 0.25 mm (measuring range 50 mm to 500 mm F.S.) typ. ± 0,04 % F.S. (measuring range 500 mm to 2,500 mm F.S.)		
Temperature drift (warm-up phase)	≤ ± 0.25 mm		
MTTFd ^{1) 2)}	69 years (EN ISO 13849-1)		

¹⁾ This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of components, average ambient temperature of electronic 60°C, frequency of use 8760 h/a.

²⁾ Every 2nd failure of an electronic component is considered as dangerous failure

Interfaces

	Analog	Digital	PWM
Electrical interface	Analog	Digital	PWM
Voltage signal	0.25 V DC ... 4.75 V DC 0.5 V ... 4.5 V 0.5 V DC ... 9.5 V DC 1 V DC ... 9 V DC	-	
Current signal	4 mA ... 20 mA	-	
Puls width	-		15% ... 85% 20% ... 85% 25% ... 75%
Busprotocol		CANopen acc. to CiA DS-301	-
Device profile	-	V4.1, SAE J 1939 DS-406 V3.1	-
Frequency	-		250 Hz 300 Hz 400 Hz 500 Hz

Electrical data

	Analog	Digital	PWM
	≤ 0.5 W ≤ 1 W	≤ 1 W	
Connection type	Male connector, M12, 4-pin Cable, 3-wire	Male connector, M12, 5-pin,	Male connector, M12, 4-pin Cable, 3-wire
Supply voltage	12 VDC (8 ... 16 VDC) 24 VDC (8 ... 30 VDC)	24 VDC (8 ... 30 VDC)	
Residual ripple supply voltage	< 1% S-S		
Power consumption	≤ 0,5W (12 VDC) ≤ 1 W (24 VDC)	≤ 1,0 W	
Current consumption	≤ 30mA (12 VDC) ≤ 40mA (24 VDC)	≤ 40mA	
Load resistance			
Voltage signal	RL ≥ 10 kΩ	-	-
Current signal	100 Ω ≤ RL ≤ 500 Ω	-	-
Bustermination	-	120 Ω	-
Inrush current	typ. 2,5 A / 50 µsec (12 VDC) typ. 5,0 A / 50 µsec (24 VDC)	typ. 5,0 A / 50 µsec	
Overvoltage protection	on all poles ≤ +36 VDC		
Reverse polarity protection	on all poles		
Insulating resistance	R _{iso} ≥ 10 MΩ, 60 sec		
Dielectric strength	500 VDC (0 VDC against housing)		

Mechanical data

	Analog	Digital	PWM
Construction size	48f7 mm (for installation in fit 48H8)		
Ø Pressure pipe	10 mm		
Ø O-ring	40,87 mm x 3,53 mm		
Ø Supporting ring	42,6 mm x 48 mm x 1,4 mm		
M12 flange	EN 61076-2-101 construction form 20x20mm- hole pattern 14mm		
Cable M12	60 ... 240 mm	-	60 ... 240 mm
Cable, 3 wire	Ø 5,0 mm, 3x 0,38mm ² (AWG22), 300 ...10.000 mm	-	Ø 5,0mm, 3x 0,38mm ² (AWG22) , 300 ...10.000 mm
Pressure pipe material	Stainless steel 1.4306, Al SI 304L		
Electronics housing material	Stainless steel 1.4305, Al SI 303		
O-ring material	NBR 70		
Supporting ring material	PTFE		
M12 plug insert material	Polyamide reinforced, nickel plated / gold plated contacts		
M12 flange material	nickel-plated brass with O-ring (NBR)		
Cable material	Jacket PUR, stranded wire PVC		

Ambient data

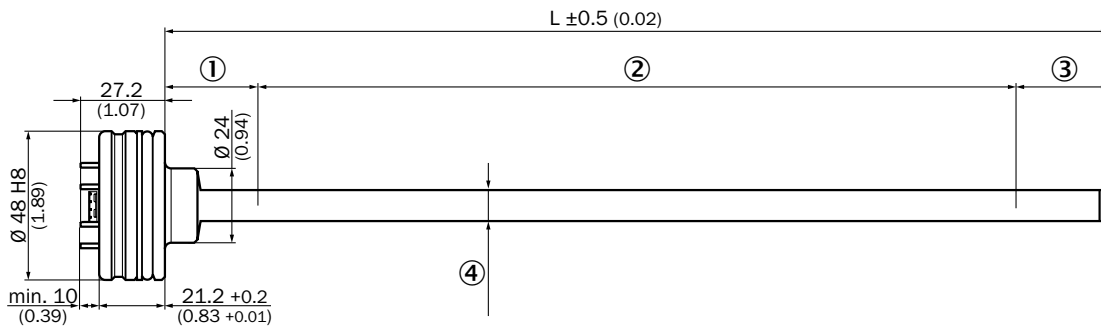
	Analog	Digital	PWM
EMC	EU Directive 2014/30/EU CE marking EU Directive 2009/64/EU Agricultural machinery		
Generic standards	EN-61000-6-2 and EN 61000-6-3		
Agricultural and forestry machinery Construction machinery	ISO 14982 EN13307/ ISO 13766		

	Analog	Digital	PWM
Transient pulses	ISO 7637-2		
ESD (air and contact discharge)¹⁾	EN 61000-4-2, ISO/TR 10605		
Enclosure rating			
Housing	IP67 (EN 60 529)		
M12 male connector	IP69k (ISO 20653)		
Operating temperature range (electric)	-40 °C ... +105 °C		
Ambient temperature (fluid)	-30 °C ... +95 °C		
Permissible relative humidity	90 % (Condensation not permitted)		
Storage temperature range	-20 °C ... +85 °C (r.H. 55%)		
Resistance to shocks	Fall test in acc. with IEC60068-2-31 100 g, 11 ms (Single shock in acc. with IEC60068-2-27) 50 g, 11 ms (Continuous shocks, 1,000 shocks per spatial axis in acc. with IEC 60068-2-27)		
Resistance to vibration			
Sinus	IEC 60068-2-6 20g, 24 h		
Sinus noise	IEC 60068-2-80 18g (r.m.s.) 36 h		
Noise	IEC 60068-2-64 20g (r.m.s.) 48 h (resonances except)		
Nominal operating pressure (P_N)	400 bar		
Max. overload pressure during operation (P_N x 1.5)	480 bar		
Max. test pressure in cylinder (P_N x 1.5)	600 bar		

¹⁾ Applied tests and descriptive standards can be found in document 8021472

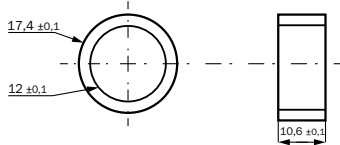
Dimensional drawing

MAX48

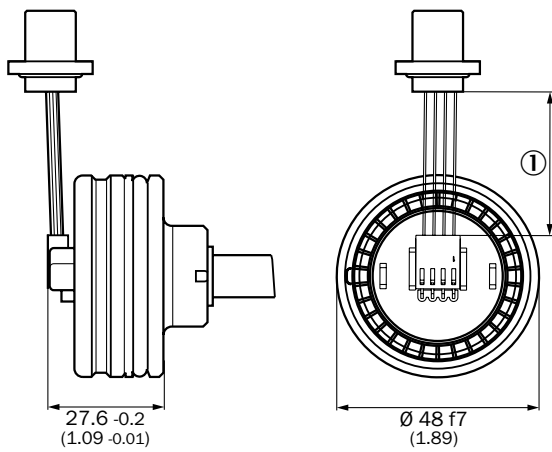


- ① Null zone
- ② Measuring range
- ③ Damping zone
- ④ Diameter of the pressure pipe

Position magnet



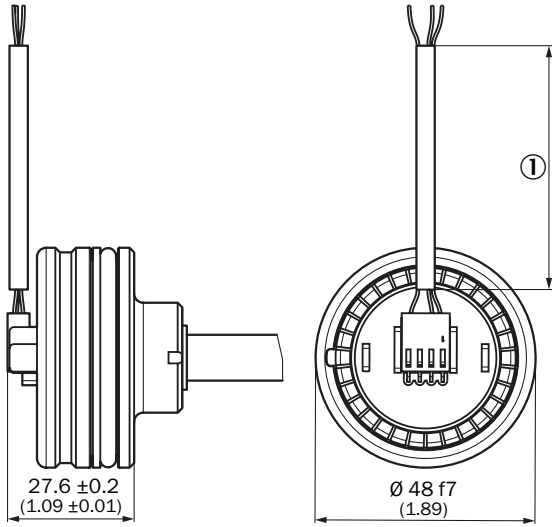
Male connector M12



- ① Cable length

Type	Cable length
MAX48N-xxxxxAxxxx	60 mm
MAX48N-xxxxxCxxxx	80 mm
MAX48N-xxxxxExxxx	100 mm
MAX48N-xxxxxGxxxx	120 mm
MAX48N-xxxxxHxxxx	140 mm
MAX48N-xxxxxJxxxx	160 mm
MAX48N-xxxxxKxxxx	180 mm
MAX48N-xxxxxMxxxx	200 mm
MAX48N-xxxxxNxxxx	220 mm
MAX48N-xxxxxPxxxx	240 mm

Cable, 3-wire

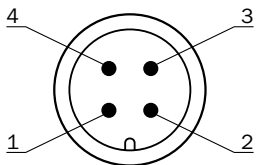


① Cable length

Type	Cable length
MAX48N-xxxxx1xxxx	300 mm
MAX48N-xxxxx2xxxx	500 mm
MAX48N-xxxxx3xxxx	750 mm
MAX48N-xxxxx4xxxx	1000 mm
MAX48N-xxxxx5xxxx	1500 mm
MAX48N-xxxxx6xxxx	2000 mm
MAX48N-xxxxx7xxxx	3000 mm
MAX48N-xxxxx8xxxx	5000 mm
MAX48N-xxxxx9xxxx	10000 mm

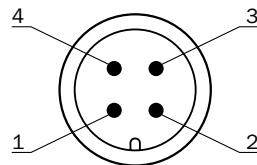
PIN assignment

PIN assignment A



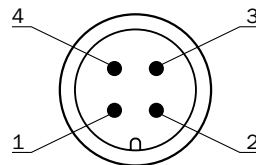
- ① VDC
- ② N. C.
- ③ GND
- ④ Signal

PIN assignment B



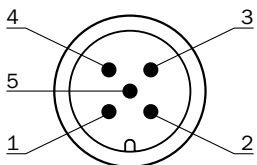
- ① VDC
- ② Signal
- ③ GND
- ④ N. C.

PIN assignment M



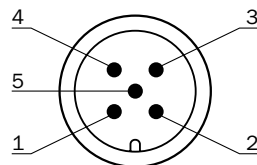
- ① N. C.
- ② VDC
- ③ GND
- ④ Signal

PIN assignment C



- ① N. C.
- ② VDC
- ③ GND
- ④ CAN_H
- ⑤ CAN_L

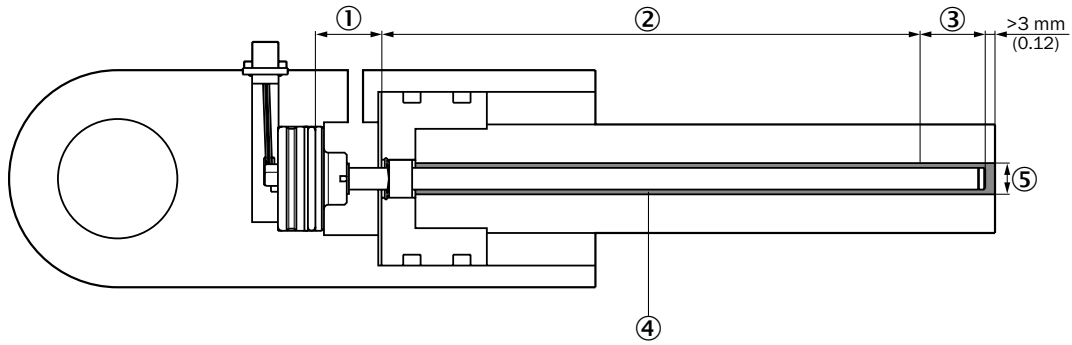
PIN assignment D



- ① VDC
- ② N. C.
- ③ GND
- ④ CAN_H
- ⑤ CAN_L

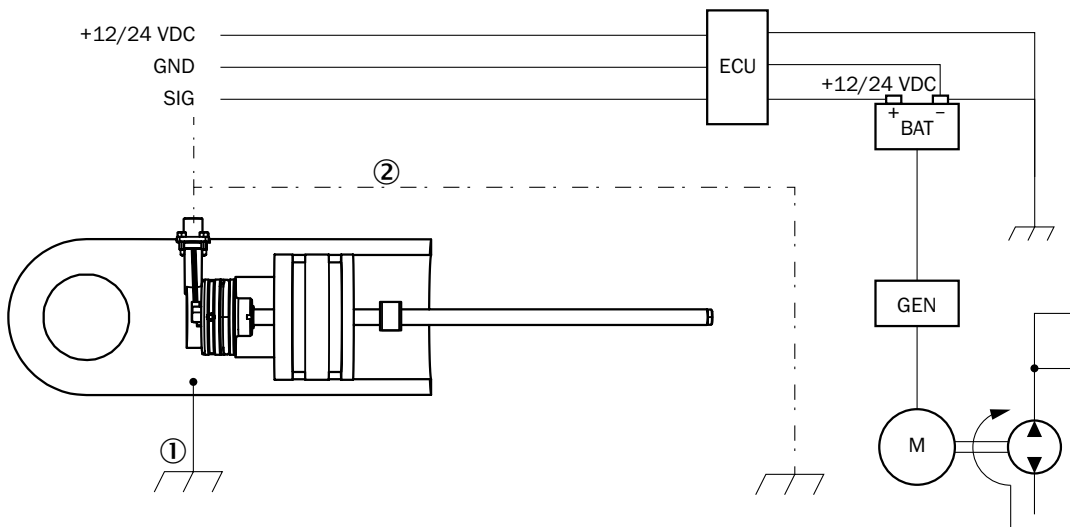
Assembly note

Installation cavity for the piston rod and pressure pipe



- ① Null zone
- ② Measuring range
- ③ Damping zone
- ④ Diameter of the pressure pipe
- ⑤ Diameter of the piston rod bore hole

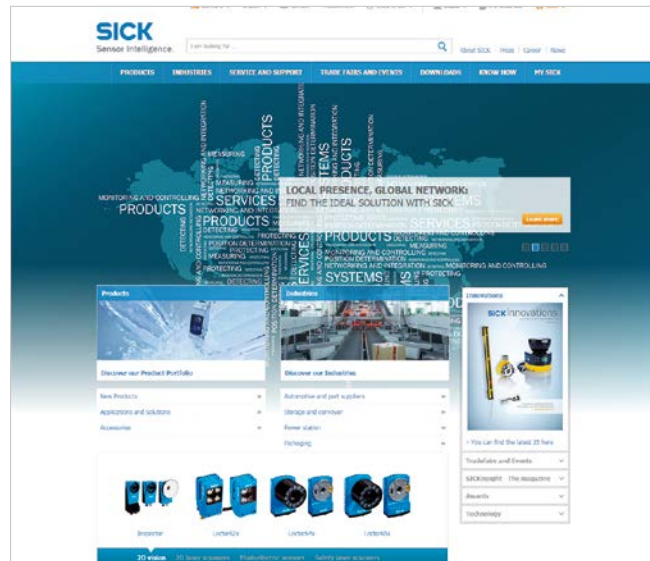
Connection diagram



- ① Chassis GND
- ② Cable shielding (optional)

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